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AUTHOR Burnett, David Wallace
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ABSTRACT

The taxonomy outlined in this paper provides a framework for the classification of performance objectives. The taxonomy has three levels: (1) demonstration of cognitive mastery; (2) demonstration of a task in isolation; and (3) demonstration of a task in context. As one moves up the taxonomy, the student's performance requires a longer period of time for completion. The student must integrate a larger number of activities, and there are fewer specific rules for the student to follow. The student must exercise higher levels of judgment and demonstrate mastery of skills in increasingly realistic situations. Use of the taxonomy clarifies the intent of instructional objectives that are limited to a statement of the content to be learned or the skill to be mastered. The taxonomy can be used to compare instructional programs or to compare assessment instruments and match them with the course objectives. In some cases, the highest level in the taxonomy is not always the most appropriate level, since in many instances, a student must understand the task before it can be performed. While use of the taxonomy may reveal alternate methods of assessment, it does not always dictate the most appropriate method. (SLD)

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David Wallace Burnett, Ph.D.
Office of Occupational Education
South Carolina Department of Education

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TAXONOMY OF PERFORMANCE OBJECTIVES

David Wallace Burnett, Ph.D.
Office of Occupational Education
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TAXONOMY OF PERFORMANCE OBJECTIVES

Even after forty years, the most well-known systems for classifying educational objectives are the taxonomies proposed by Benjamin Bloom and his associates. A "taxonomy," according to Bloom (Bloom, et. al., 1956), is not simply a classification system. A taxonomy is more complex than simple classification since it presents its elements in a manner that reflects some "real" order underlying the phenomena that are classified, while a classification system may sort elements into an arbitrary set of categories. Bloom cited as an example of a taxonomy the phylogenetic scale, which classifies living creatures according to phylum, genus, and species, and orders them on a scale of increasing complexity.

The original Taxonomy of Educational Objectives: Cognitive Domain (Bloom, et. al., 1956) classifies those educational objectiv s which are concerned with remembering or recognizing material that has been learned and with using that material to solve intellectual problems. The taxonomy identifies six levels, or types, of objectives: knowledge, comprehension, application, analysis, synthesis, and evaluation. The taxonomy of the affective domain (Krathwohl et. al. 1964) classifies objectives which emphasize the development feelings, values, and interests, and the acceptance or rejection of ideas. Objectives are classified in five levels: receiving, responding, valuing, organization, and characterization by a value or value complex.

A taxonomy of psychomotor objectives was to deal with muscular or motor skills, the manipulation of objects, and muscular coordination. It has never been published. However, a number of other taxonomies of psychomotor behaviors have been proposed. One of these, proposed by E.J. Simpson in 1966 is typical (DeLandsheere, 1991). Simpson's taxonomy has five levels:

- perception, the awareness of a task;
- set, the readiness to perform a task;
- guided response, the performance of a task while one is coached, or taught, how to perform;
- mechanism, the transformation of a learned response into a habit; and
- complex overt response, the performance of a task without hesitation and the automatic performance of the task, without conscious thought.

Simpson suggested that there might be a sixth level, adjusting / organizing, at which the individual is able to create new sequences of motor responses.

The taxonomies of Bloom and his associates, and those proposed by others in the field of curriculum, provide frameworks for the analysis and classification of a wide range of educational outcomes. Unfortunately, none of the these taxonomies provides an adequate description of the performance objectives that underlie much of the instruction provided in occupational or vocational education programs. Taxonomies of the cognitive domain emphasize the intellectual processes on which performance is based, but they do not account for objectives which emphasize the performance rather than the process. Few of our objectives address affective issues, although industry is increasingly demanding that our graduates demonstrate certain values (U.S. Department of Labor, 1992). Even the taxonomies of psychomotor behavior, which might provide descriptions of performance outcomes, seem more appropriate for simple tasks such as riding a bicycle or hammering a nail than for the wide range of complex behaviors that we envision for our students.

The Taxonomy of Performance Objectives

The taxonomy outlined in this paper provides a framework for the classification of performance objectives. The taxonomy has three sections: demonstration of cognitive mastery, demonstration of a task in isolation, and demonstration of a task in context. Each section describes a different type of objective. The third section has three parts, each of which describes a different context in which mastery is demonstrated. The resulting five levels are organized in terms of the complexity of the behavior that the student must exhibit when demonstrating mastery of the objective. Complexity is evaluated in terms of

1. the amount of time that is required,
2. the number of individual activities, tasks, or skills that the student must must complete or demonstrate,
3. the extent to which the activities, tasks, or skills must be integrated and coordinated to accomplish a goal,
4. the extent to which the student's performance is governed by a specific set of rules or directions, and
5. the extent to which the student must use judgment to select the appropriate activities, tasks, and skills, and to organize them to accomplish a goal.

As one moves up the taxonomy, the student's performance requires a longer period of time for completion, the student must integrate a larger number of activities, there are fewer specific rules for the student to follow, the student must exercise higher levels of judgment, and the student must demonstrate mastery of skills in increasingly realistic situations.

Level I. Demonstration of Cognitive Mastery

Basic to the performance of most activities is "knowledge about" the activity. Objectives at this level are cognitive objectives. They frequently begin with words such as "list," "explain," "describe," "compare," or "analyze." These objectives may appear at any of the levels of Bloom's taxonomy of cognitive objectives . However, regardless of whether an objective addresses the ability to recall a fact, to compare and contrast concepts, or to synthesize or evaluate information, it emphasizes the development of an intellectual process which may support a variety of types of performance. As a *performance objective* it represents a state that is preliminary to an actual performance. Objectives at this level may often be assessed appropriately through the administration of traditional tests.

Level II. Demonstration of a Task in Isolation

A task is a relatively simple, routine, time-limited activity that is performed according to a set of directions. One might describe a task as being performed "correctly" or "incorrectly." At this level of the taxonomy, mastery of the ability to perform a task is assessed apart from the ability to perform related tasks. There is no attempt to observe the task in context, nor to determine how performance of the task relates to the performance of other tasks. Objectives at this level, and above, will ordinarily be assessed through an observation of the student's behavior (perhaps recorded on a checklist), or through inspection of the results of the student's behavior (a "product.")

Level III. Demonstration of a Task in Context

At this level, a student performs multiple tasks to accomplish some goal. An assessment of mastery may focus on the performance of individual tasks, or on the integration of the multiple tasks, or both.

A. Demonstration of a Skill

A skill is more complex than a task, and its demonstration may require the integration of multiple tasks to attain a goal. Demonstration of a skill may require more time than does performance of a task. Typically, there are multiple ways for the student to demonstrate mastery of a skill. The student must use judgment to determine the specific activities that are required and, often, the sequence in which the activities should occur.

B. Creation of a Product

Creation of a product frequently will require the student to use a number of skills in a coordinated program designed to attain some goal. Typically, creation of a product requires sustained effort over a period of time. Assessment of objectives at this level may focus on the quality of the product, as well as on the creative process, itself.

C. Completion of a Project

A project requires the integration of a number of skills and may result in the creation of multiple products. A project, however, is not merely a collection of products. Multiple products created as parts of a project are related to each other, and each product is designed to contribute to the attainment of some overall goal. Projects require relatively large amounts of time for completion. While each product may be assessed individually, attention will also focus on an assessment of the project as an integrated whole.

As Krathwohl (1964) noted, a taxonomy of educational objectives can be used in a variety of ways. He suggested that the primary value of the use of a taxonomy of educational objectives lies in the increased clarity of communication that its use fosters among educators.

Since a educational program's objectives define the purpose of the program, it is important to specify not only the content of the instruction, but also what the students should be able to do with the content. Objectives always specify the content, but they frequently fail to specify how mastery will be demonstrated. The taxonomy, however, clearly describes the type of behavior by which students will demonstrate mastery of what they have learned. Use of the taxonomy, therefore, clarifies the intent of instructional objectives which are limited to a statement of the content to be learned or the skill that is to be mastered.

The need to specify both content and the method of demonstrating mastery is particularly apparent when one is comparing the objectives of two instructional programs. For example, Table 1 compares objectives for two hypothetical accounting programs.

Insert Table 1 About Here

In both programs, students study the fundamentals of accounting: journalizing transactions, posting to ledgers, balance sheets, income statements. The first program, however, is geared toward the lower levels of the

taxonomy. Students are expected to be able to define terms, to explain procedures, and to be able to perform simple book keeping tasks. Students in the second program, are expected to be able to perform various accounting functions and to utilize their skills to produce accounting exhibits. The first program might be intended as a "non-majors" course for students who need to be acquainted with the principles of accounting - - marketing students, perhaps - - but who do not need to be able to actually perform accounting tasks.

The differences between programs can, in fact be dramatic. In reviewing objectives for occupational programs in South Carolina, we noted that competency lists for two of our business education programs differed greatly in the level at which the competencies were written. In one course, sixty per cent of the competencies were cognitive competencies that would most appropriately be assessed at the first level of the taxonomy. The other competency list was compose almost entirely of competencies written at higher levels, including several which demanded the creation of products and which could very appropriately have been assessed in the context of a comprehensive project.

By classifying their program's objectives, staff can determine whether the objectives match their expectations for their students. Perhaps the first program in Table 1 is not intended for non-majors. If not, then the realization that their accounting students are being taught to "know about" accounting, rather to be able to "do" accounting should cause staff to revise their objectives and, as a result, their instruction.

The taxonomy can also be used to compare assessment instruments and to match assessment instruments with course objectives. A valid assessment must reflect not only the content of instruction, but also the intended outcomes of instruction Although it might address the topics that were discussed in class, an assessment prepared for students in the first program in Table 1 would lack content validity if it were to be used with students enrolled in the second program, since the objectives of the first program are largely cognitive, while those for the second program emphasize application. By the same token, an assessment based on the objectives for the second program would be inappropriate for students in the first class.

Outcomes should be identified prior to the development of assessment instruments. In South Carolina, as we revised our course competencies prior to the development of a series of occupational competency assessments, teams of teachers classified each competency, using an earlier version of the taxonomy. The sets of objectives and the taxonomy then formed tables of specifications for the competency assessments.

In addition to promoting clarity regarding instructional objectives, the taxonomy can be used to clarify the most appropriate methods for assessing a particular activity. Table 2 demonstrates how an activity can be assessed at different levels of the taxonomy.

Insert Table 2 About Here

In the first example, we are assessing the student's ability to change a spark plug. The student's performance could be assessed through a description of the steps involved in changing a spark plug, or the student could be asked to actually change a plug. The ability to change the spark plug can be assessed in isolation, or as a part of some larger activity: replacing an entire set of plugs, performing a tune up, or performing routine maintenance on an automobile.

In the second example, the student is to design a display sign for a merchandise display. Again, the student can describe how to design a sign, can simply design a sign, or can design a sign as a part of an increasingly complex activity.

When the student's performance is assessed in context, the assessment may occur in conjunction with the assessment of a number of other objectives. On one hand, the context changes the task or the skill that is being assessed, since the task is embedded in a sequence of activities, and, often, it must be performed in conjunction with those other activities to attain some larger goal. On the other hand, the assessment situation more closely resembles the situations that students will encounter outside of school.

As a method for clarifying the most appropriate method for assessing mastery of some activity, the taxonomy's primary value lies in its ability to present a variety of alternate methods of assessment. The objectives in Table 2 may have been written with particular methods of assessment in mind, but, as Table 2 illustrates, each objective can be assessed in a number of ways. The taxonomy can be used to clarify the alternatives that exist and to assist in the choice of the most appropriate alternative.

In regard to the most appropriate method for assessing mastery, the highest level in the taxonomy is not always the most appropriate level. A program's objectives should be identified from an analysis of what the students should know and be able to do as a result of instruction. In a great many cases, an objective is most appropriately assessed at the lower levels of the taxonomy: a student must understand a task before the student can perform it; a

task must be performed in isolation before it can be integrated with other tasks; and introductory courses will, typically, adopt lower level objectives than will advanced level courses. While use of the taxonomy may reveal alternate methods of assessment, it does not dictate the most appropriate method.

Table 1
Comparison of Objectives for Two Accounting Programs

LEVEL	PROGRAM 1	PROGRAM 2
I. Demonstrate Cognitive Mastery	1. Explain the accounting cycle 2. Explain the purpose of a balance sheet and an income statement 3. Identify the primary components of a balance sheet and an income statement 4. Define asset, liability and capital accounts 5. Classify accounts as asset, liability, or capital accounts 6. Analyze the accounting equation	
II. Perform a Task	7. Post transactions to a general journal 8. Post transactions from a general journal to a general ledger 9. Prepare a trial balance 10. Close the ledger.	1. Post transactions to a general journal 2. Post transactions from a general journal to a general ledger. 3. Post transactions to a cash journal 4. Post transactions from a cash journal to a cash ledger 5. Prepare a trial balance. 6. Close the ledger.
IIIa. Demonstrate a Skill		7. Given data for a merchandising business, set up the required accounts, post the transactions, and prepare a trial balance. 8. Journalize source documents in accounting subsystems.
IIIb. Create a Product		9. Given the necessary data, prepare the balance sheet and income statement for a merchandising business
IIIc. Complete a Project		10. Develop an accounting system for the XYZ company. Set up all journals and ledgers. Given appropriate data, record the transactions, close the books, and prepare year end financial statements.

Table 2
Assessing Objectives at Different levels of the Taxonomy

Activity:	Change a spark plug.	Design a display sign.
Level		
I. Demonstrate Cognitive Mastery	Explain how to change a spark plug.	Explain the use of color, lettering, spacing, and size in the design of display signs
II. Perform a Task	Change a spark plug	Design a display sign.
IIIa. Demonstrate a Skill	Given an automobile with the spark plug wires unplugged and a set of spark plugs, set the gap, if necessary, replace the plugs, and attach the proper wire to each plug	Design a preliminary display.
IIIb. Create a Product	Tune an automobile engine.	Construct a display sign.
IIIc. Complete a Project	Given a late model automobile with 60,000 miles, perform all routine maintenance according to the manufacturer's specifications.	Design and construct a display. The display must include a background, a mannequin, and at least one sign.

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